

Patent Claims

1. A gas permeable probe for use in an optical analyzer for an exhaust gas stream flowing through a duct or chimney, the probe comprising:

- an elongate hollow structure having first and second ends and a side wall, with an optical cavity defined between said first and second ends within said side wall,
- a mounting structure at said first end and adapted for mounting said elongate hollow structure within said duct or chimney,
- a support member at said second end,
- a connecting structure connecting said mounting structure at said first end to said support member at said second end,
- an optical window at said first end permitting a beam of light originating from an optical analyzer to enter into said optical cavity to travel from said first end to said second end,
- a filter forming a part of said side wall, and
- a retroreflector provided at said second end for returning said light beam to said first end of said hollow structure,
- said optical window being releasably mounted at said first end of said elongate hollow structure and/or said retroreflector being releasably mounted at said second end of said elongate hollow structure.

2. A gas permeable probe in accordance with claim 1, wherein said retroreflector is releasably connected to said support member at a side of said support member remote from said optical window and aligned with an opening in said support member.

3. A gas permeable probe in accordance with claim 2 and further comprising a releasable cover member surrounding said retroreflector.
4. A gas permeable probe in accordance with claim 3, there being at least one threaded fastener releasably connecting said cover member to said support member.
5. A gas permeable probe in accordance with claim 2, said retroreflector having a front side disposed adjacent said support member and a rear side disposed remote from said support member, a releasable reaction member spaced from said support member and at least one spring resiliently mounting said retroreflector with respect to one of said support member and said reaction member.
6. A gas permeable probe in accordance with claim 5, said at least one spring being disposed between said releasable reaction member and said rear side of said retroreflector, said front side of said retroreflector being disposed adjacent said support member.
7. A gas permeable probe in accordance with claim 5, said at least one spring being disposed between said support member and said front side of said retroreflector, said rear side of said retroreflector being disposed adjacent said reaction member.
8. A gas permeable probe in accordance with claim 5, wherein said reaction member has a central recess and said at least one spring is disposed in said central recess.

9. A gas permeable probe in accordance with claim 8, wherein said at least one spring comprises a compression coil spring.

10. A gas permeable probe in accordance with claim 9, wherein a movable piston is disposed between said compression coil spring and said rear side of said retroreflector, said piston being movably guided in said recess.

11. A gas permeable probe in accordance with claim 5, wherein at least one threaded fastener is provided for connecting said reaction member to said support member.

12. A gas permeable probe in accordance with claim 5, said reaction member being rigidly connected to said support member via a spacer.

13. A gas permeable probe in accordance with claim 12, said spacer being a cylindrical spacer separate from said reaction member having first and second ends.

14. A gas permeable probe in accordance with claim 13, said cylindrical spacer being formed as an electrical heater for said retroreflector.

15. A gas permeable probe in accordance with claim 13, wherein first and second ring seals are provided at said first and second ends of said spacer.

16. A gas permeable probe in accordance with claim 13, wherein said first and second ends of said spacer are received in respective ring recesses in said support member and said reaction member.

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17. A gas permeable probe in accordance with claim 1 and further comprising a ring recess having a base and formed in said mounting structure at said first end of said elongate hollow structure, said optical window being disposed in said ring recess and being accessible when a filter forming part of said elongate hollow structure is removed.
18. A gas permeable probe in accordance with claim 17, wherein said ring recess is provided in a first mounting flange of said mounting structure.
19. A gas permeable probe in accordance with claim 18, wherein said mounting flange has a first side adjacent said elongate hollow structure and a second side remote from it and wherein a pressure ring is provided at said first side.
20. A gas permeable probe in accordance with claim 19, wherein said pressure ring has a ring shaped axial projection engaging into said ring recess.
21. A gas permeable probe in accordance with claim 21, wherein first and second ring seals are provided, said first ring seal being disposed between said optical window and said base of said ring recess and said second seal being provided between said optical window and said axial projection of said pressure ring.
22. A gas permeable probe in accordance with claim 21, there being a ring groove at said base of said recess and a ring groove in said axial

projection, with said first and second seals each being arranged in a respective one of said ring grooves.

- 23. A gas permeable probe in accordance with claim 19 and further comprising:  
a plurality of threaded fasteners extending through said pressure ring and said mounting flange for clamping them together.
- 24. A gas permeable probe in accordance with claim 23, wherein said threaded fasteners engage into a ring-shaped connecting member provided at a side of said mounting flange remote from said pressure ring.
- 25. A gas permeable probe in accordance with claim 23, wherein said filter includes a connection flange disposed adjacent said first end of said elongate hollow structure and said threaded fasteners also pass through said connection flange.
- 26. A gas permeable probe in accordance with claim 23, wherein a heater for said optical window is positioned adjacent to it.
- 27. A gas permeable probe in accordance with claim 26, wherein said threaded fasteners engage into a ring-shaped connecting member provided at a side of said mounting flange remote from said pressure ring, said ring-shaped connecting member having an axial projection and said heater comprising a ring-shaped heater mounted on said axial projection of said ring-shaped connecting member.
- 28. A gas permeable probe in accordance with claim 25, wherein said filter comprises an elongate modular filter forming part of said elongate hollow structure.

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gate hollow structure, said modular filter having first and second opposite ends and includes a filter structure having at least one filter member, a bellows at one of said first and second opposite ends adjacent said filter structure, said connection flange at said first opposite end and a further connection flange at said second opposite end adjacent said support member, said pressure ring and said optical window being removable on releasing said threaded fasteners and removing said elongate modular filter.